A RETROSPECTIVE CONTENT ANALYSIS OF THE AMBULANCE EMERGENCY ASSISTANT REFRESHER COURSE OUTCOMES AS COVERED BY FREE OPEN ACCESS MEDICAL EDUCATION (FOAMED) RESOURCES

by

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DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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(J Steyn)

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ABSTRACT

Continuous professional development (CPD) is a requirement for all healthcare professionals in South Africa. The shift-driven work environment of pre-hospital care often makes attending CPD events logistically impractical to practitioners. Free open access medical education (FOAMed) and online learning could make CPD activities more accessible. The objective of the study presented in this report, was to determine to what extent available FOAMed resources could be used to supplement the outcomes for successful completion of the AEA-refresher course.

A retrospective content analysis methodology was adopted to review FOAMed resources posted within a 2-month period for their ability to cover the outcomes of the AEA-refresher course. Data was subject to a three-step process of content analysis that was matched to 17 identified AEA-refresher course outcomes (themes). The FOAMed resources (qualitative data) matched to the course outcomes were converted into quantitative data (the frequency of the themes). A total of 441 FOAMed posts were reviewed during a 2-month period. Of the 441 posts, 61% (269) were excluded based on inclusion criteria related to the AEA practitioner's capabilities and relevance. Thus, the remaining 39% (172) FOAMed posts were relevant to cover the 17 identified outcomes of the AEA-refresher course. The two most frequently observed themes were related to [i] professionalism with 45 (26.2%) posts and [ii] general other medical emergencies with 39 (22.7%) of the 172 posts. The remaining 15 themes all had up to 8% representation respectively.

The study has highlighted the potential of FOAMed resources to supplement the delivery of CPD activities, like the AEA-refresher course. However, given that the outcomes were unequally represented, educational institutions wishing to make use of FOAMed to supplement delivery of CPD events should be aware of the affordances that FOAMed can offer with due caution given to the residual critiques and limitations of FOAMed.

OPSOMMING

Deurlopende professionele ontwikkeling (DPO) is ’n vereiste waaraan alle gesondheids professionele in Suid-Afrika moet voldoen. Werk in ‘n skof gedrewe omgewing waarin paramedici hulself bevind heed dit dikwels logisties onprakties om DPO aktiwiteite te kan bywoon. ‘*Free open access medical education (FOAMed)’* en aanlyn-leer kan DPO aktiwiteite meer toeganklik maak. Die doel van die studie, aangebied in hierdie verslag, was om te bepaal tot watter mate beskikbare ‘*FOAMed’* hulpbronne die uitkomste vir suksesvolle voltooiing van die Ambulans Nood Assistent (ANA) opknappingskursus kan aanvul.

’n Terugwerkende inhoudsanalise metode was toegepas om *‘FOAMed’* hulpbronne te evalueer vir hul vermoë om die uitkomste van die ANA-opknappingskurses te dek. Data was onderworpe aan ’n drie-stap proses van inhoudsanalise wat vergelyk is met 17 geidentifiseerde ANA-opknappingskursus uitkomste (temas). Die ‘*FOAMed’* hulpbronne (kwalitatiewe data) ooreengestem met die kurses uitkomste is omgeskakel in kwantitatiewe data (hoe gereeld temas teenwoordig was). In totaal is 441 ‘*FOAMed’* hulpbronne hersien tydens ‘n 2-maande periode. Van hierdie 441 hulpbronne, is 61% (269) uitgesluit, gebaseer op insluitings kriteria verwant aan die ANA vermoëns en relevansie. Dus, die oorblywende 39% (172) ‘*FOAMed’* hulpbronne was relevant tot die 17 geidentifiseerde ANA-opknappingskursus uitkomste. Die twee temas mees gereeld waargeneem was verwant aan [i] professionaliteit, met 45 (26.2%) van die hulpbronne en [ii] algemene ander mediese noodgevalle met 39 (22.7%) van die 172 hulpbronne. Die oorblywende 15 temas het onderskeidelik almal tot en met 8% verteenwoordiging gehad.

Die studie het uitgelig die potensiaal wat ‘*FOAMed’* hulpbronne kan bied tot aanvulling van die lewering van DPO aktiwiteite, soos die ANA-opknappingskurses. Gegewe dat die uitkomste ongelyk verteenwoordig was, sal opvoedkundiginstellings, wat van ‘*FOAMed’* hulpbronne tot aanvulling van DPO aktiwiteite wil gebruik maak, bewus moet wees van die huidige beperkings en kritiek van ‘*FOAMed’* en dus die nodige versigtigheid toepas.

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1. INTRODUCTION

It is well known that the health profession is dynamic in that it is ever evolving and changing (Weingart & Fraust, 2014; Leeuwenburg & Parker, 2015; Laal & Salamati, 2012). Technologic advances, globalisation and changes in the world's health needs represent only a few reasons why healthcare professionals need to be lifelong learners and continue in their professional development (Laal & Salamati, 2012). Working in an emergency care setting requires providers to remain current and practiced in life-saving interventions like resuscitation and trauma care. This notion is supported by resuscitation and trauma organizations worldwide where new and updated guidelines are released every 5 years (Weingart & Fraust, 2014). These guidelines provide practicing emergency care providers with the latest recommended evidence based medicine and best practice treatment strategies. Staying up to date with the ever-evolving world of emergency care is essential to ensure that the best quality care is delivered to patients.

Working in a shift-driven environment often poses a challenge to emergency care providers to find the time to stay up to date with the latest recommended medical care. Emergency care providers, like most health care professionals, are required to attend continuous professional development (CPD) activities to maintain knowledge and skills. CPD refers to any activities that supports lifelong learning and enhancing the competence (knowledge, attitudes and skills) of healthcare professionals (Forsetlund et al., 2009; Lessing & De Witt, 2007). One way in which CPD is addressed in the medical profession is through conferences (Forsetlund et al., 2009), however a recently published article in the USA reported that on average only 25% of medical residents could attend conferences with significant late arrivals and requests to leave early (Burk, Bishop, Rahman & Koch, 2017). Although not specifically referring to emergency care providers, medical residents comparably work in a shift driven environment. This may be an indication for the need of more flexible or alternative means of delivering CPD events in the medical profession.

Lifelong learning is an ongoing process that aims to promote a continuing approach to professional learning. Lifelong learning should instill confidence in the healthcare professional to employ medical competencies (knowledge, skill and attitude) in their work environment (Laal & Salamati, 2012). Lifelong learning is recognized within the healthcare setting as one of the most important competencies that healthcare graduates must possess (Collins, 2009; Laal & Salamati, 2012). Promoting lifelong learning as continuous, self-directed and applicable to the individuals' profession has emerged as a major global educational challenge (Collins, 2009). Research into self-directed learning dates back to 1975, where Malcolm Knowles,

famous for his theory of andragogy and adult education, stated that adults learn differently to children. Adults are intrinsically motived to learn and likely to explore alternative strategies to continue their education. Alternative educational strategies, like online learning, distance learning and blended learning, could be adopted by healthcare professionals to continue their life-long learning. These strategies could also be feasible for use in CPD activities. Appropriate application of these alternative educational strategies, rather than relying simply on traditional face-to-face methods, may alleviate some of the challenges posed by CPD (Laal & Salamati, 2012).

Over the past two decades, technology has increasingly been influencing the way that we live, communicate and learn (Vaill, 1996; Siemens, 2005). In particular, the internet has become a powerful tool for the distribution of medical knowledge allowing its users to access information when, where and how they want to (Weingart & Faust, 2014). This has created opportunities for new ways in which learning can be facilitated, and as previously mentioned, could provide alternative means to facilitate CPD activities. In 2005, Siemens introduced a learning theory, called *connectivism*, in which he explained that it allows us to better understand learning and how it is influenced by technology and socialization (Siemens, 2005). Some years later Downes (2012) and Goldie (2016), critique connectivism as a learning theory and mention that it would be better applied as a conceptual framework based on the concept of knowledge and learning being distributive and not located in any given place. Alternative to traditional learning theories, connectivism seeks to explain learning in a complex social and digital world. Siemens (2005) described connectivism as ‘a learning theory of the digital age’, emphasizing that learning can no longer rely only on experiences to contribute knowledge, but competencies will be achieved by forming connections from constantly altered foundations as new technologies emerge (Siemens, 2005). Connectivism places emphasis on how technology affects the way that professionals live, communicate and learn. It has been compared to the behaviorist, cognitivist and constructivist learning theories, but is set apart by believing that learning can exist outside of the individual (i.e. within an organization, community or database) and focusses on connecting information sets and in this way enabling further learning (Siemens, 2005; Downes, 2012). While connectivism is not attempting to replace traditional educational theories, with the rapid rate at which technology is evolving, educational practices may require adjustments in the understanding of what learning is.

New educational cultures, learning theories and conceptual frameworks, such as connectivism and open educational resources (OER), are promoting development of CPD and lifelong learning by starting to adopt alternative teaching methods over the conventional classroom or face-to-face environments (Downes, 2007; Collins, 2009; Laal & Salamati, 2012). New

educational concepts (e.g. flipping the classroom) and new educational cultures (like OER and social media) are influencing educational delivery in the context of higher- and health professions education (Downes, 2007; Roland & Brazil, 2015; O'Flaherty & Phillips, 2015). OER are educational assets useful for learning, teaching, assessing and researching that are openly licensed and freely accessible (Bell, n.d). Another example of a new educational culture, specifically referring to the context of CPD, is free open-access med(ical ed)ucation (FOAMed). This approach can be seen as a more recent manifestation of OER, specific to the discipline of medical education. FOAMed has emerged as a "*dynamic collection of resources and tools for lifelong learning in medicine…*" (Nickson & Cadogan, 2014, p. 76) and a new exemplar of continuing medical education. The FOAMed belief is that high-quality medical education resources and interactions can (and should) be freely accessible to all healthcare professionals with a view to simplify access to lifelong learning. FOAMed resources are easily accessible and portable which makes them ideal for professionals to educate themselves when it best suits their schedules. Easy access and flexibility are key factors believed to positively influence adult learners (Knowles, 1975; Bahner et al., 2012; Laal & Salamati, 2012).

Context of the Study

The challenges facing healthcare professionals described earlier, and the need to balance professional and personal life, speak to the need for more accessible and flexible learning environments. Arguably, approaches to education that have fewer logistical demands and are possibly more cost-effective, may be even more relevant to resource constrained environments, like South Africa. FOAMed resources are adapted, updated and changed based on what is currently trending within the emergency care environments. Trending information can be regarded as most spoken about and relevant for current discussions as it is likely to represent the newest treatment modalities, recommendations and guidelines. For this reason, it is unlikely that FOAMed will entirely replace undergraduate or foundational education because trending subjects seldom include all the basics related to emergency care, but could suffice as a supplement or a supportive adjunct to foundational knowledge (Nickson & Cadogan, 2014; Roland & Brazil, 2015; Cevik et al., 2016).

While only two studies have been conducted to evaluate the ability of FOAMed to cover course curricula (Stuntz & Clontz, 2016; Sinton et al., 2016), none of these have evaluated it in the context of a South African medical based course curriculum. This study aimed to evaluate to which extent available FOAMed resources can be used to cover the outcomes of a postgraduate pre-hospital provider course in South Africa. The results could inform alternative delivery of CPD events for professionals in this field. In South Africa, CPD is a requirement instituted by the national health professions regulatory board, the Health Professions Council

of South Africa (HPCSA). This is applicable to all healthcare professionals in South Africa, including Ambulance Emergency Assistants (AEA). AEA practitioners fall into the middle (intermediate) level of the emergency care provider hierarchy in South Africa. Practitioners are strongly encouraged by the HPCSA to maintain current with CPD compliance as quality assurance is maintained with random audits and deregistration or monetary fines could apply if non-compliance is found (HPCSA, 2014).

The AEA-refresher programme was selected for the purpose of this study as this is a programme that the researcher was actively involved in teaching at the time to this study and the programme includes a broad range of emergency care capabilities. The basic level of emergency care provider refresher course may not have included broad enough capabilities to make the study meaningful and the advanced level refresher course had a range of capabilities that were too broad and would require a more in-depth investigation than was possible with the given time constraints. The AEA practitioners capabilities are dictated by the HPCSA [Addendum A] (HPCSA, 2011). As mentioned earlier, maintaining knowledge and skill with regard to the latest recommended treatment guidelines and to adhere to quality assurance mechanisms, CPD is crucial to these healthcare practitioners. The most common CPD activity available to AEA practitioners is the *AEA-refresher course* (see addendum B for AEA-refresher course outcomes). This 5-day classroom based course (accredited by the HPCSA) aims to provide the practitioner with revision of knowledge gained during their original training, opportunity to practice skills not commonly used in everyday practice and inform the practitioners of any treatment guideline updates and/or changes. AEA practitioners are expected to achieve cognitive educational objectives appropriate to the first three levels of Blooms Taxonomy (HPCSA, 2015). These are knowledge, comprehension and application. Blooms Taxonomy (see Figure 1) is a hierarchical model used to classify educational learning objectives into levels of complexity (Bloom, Engelhart, Furst, Hill & Krathwohl, 1956). AEA practitioners should not only know and understand the fundamentals of emergency care, but have the ability to apply this to their practice. Anecdotal observations suggest that the AEA-refresher course is not well attended by many practitioners due to constraints like time off work, travel to and accommodation at education institutions. If this is in fact true, it is potentially to the detriment of the patient as these practitioners are not current with the latest treatment recommendations and guidelines.

Structure of the Assignment

This assignment is built around an article that has been prepared for submission to the *African Journal of Health Professions Education (AJHPE)* (see addendum E for journal guidelines).

This introduction has provided the reader with an outline of the challenges that healthcare providers face in order to continue life-long learning and CPD; and new educational strategies that utilize influences of technology and social media to facilitate learning were introduced. The context of the study within delivery of post-graduate education to emergency care providers in South Africa was provided. The assignment continues with an extended literature review that supplements the context provided in the article. Subsequent to this, additional details are provided for the research methodology. There may be aspects of the literature review and methodology that are repeated in the article section. The assignment conclusion is followed by a reference list and addenda.

2. EXTENDED LITERATURE REVIEW

FOAMed (Free Open Access Medical Education)

FOAMed is a term that has become well established in the emergency services community (Weingart & Faust, 2014; Leeuwenburg & Parker, 2015; Cevik et al., 2016; Nickson & Cadogan, 2014). The term has gained popularity within the community as a collection of freely available educational materials and information (Nickson & Cadogan, 2014). FOAMed was conceived in 2012 and has since been evolving as a prototype in continuing professional education (Weingart & Faust, 2014; Leeuwenburg & Parker, 2015). FOAMed resources are distributed via various social media platforms as podcasts (audio), vodcasts (video) and blogs (article). Since 2012, many websites have emerged and become well known as reliable contributors to FOAMed (Nickson & Cadogan, 2014). With no formal way of assessing the impact and quality of these websites or awarding scholarly credit to the authors, the Social Media index (SMi) was created to help address this. The SMi utilizes logarithmic variations of three social media platforms (Alexa website rank, Twitter followers and Facebook likes) to derive a score ranked from 0 to 10. Although not perfect, at present the SMi is the only way that impact and quality of online medical education resources can be rated (Thoma et al., 2015a). Table 1 lists the top 15 SMi rated FOAMed contributors as reported by Thoma in April 2017. It may be important to add that the top 5 rated sites have not changed since June 2015 (https://www.aliem.com/social-media-index/). It is claimed that FOAMed has the potential to shorten the knowledge transition gap between inception, publication and bedside application (Diner et al., 2007; Leeuwenburg & Parker, 2015). Not only is this prediction that new and updated medical modalities could be implemented at the patient's bedside sooner, embraced internet technologies and social media learning could enhance the dissemination of peer-

reviewed medical knowledge faster and with potentially improved accuracy (Weingart & Faust, 2014).

Table 1. Top 15 FOAMed websites rated by the Social Media Index (Thoma, 2017).

Rank	Site name
1	Life in the Fast Lane (LITFL)
2	EMCrit Blog
3	Academic Life in Emergency Medicine (ALiEM)
4	EMS 12 Lead
5	Emergency Medicine Cases
6	Dr Smiths ECG Blog
7	Rebel EM
8	EM Docs
9	The Nurse Path
10	St Emlyn's Blog
11	Intensive Care Network
12	CanadiEM
13	Don't Forget the Bubbles
14	Core EM
15	EM Basic

Internet and Technology in Learning

The speed at which the internet and technologies are developing and the extensive use of mobile technological devices by learners, educators and patients highlight the need for understanding the many ways that internet and technologies can be used in health professions education (Masters, Ellaway, Topps, Archibald & Hogue, 2016). In the 21st century the web has become a globally acceptable distributor of knowledge and information, has been described as a revolution on the internet, a new way to host web-based communities, promote creativity, active collaboration and information sharing (O'Reilly, 2005; Downes 2012; Bartolomé, 2008; McGowan et al., 2012). Furthermore, the web enables learning anytime in any place via multiple distribution platforms (like mobile devices), and has brought forward the growth of OER and social media (Downes, 2007; Cheston, Flickinger & Chisolm, 2013; McGowan et al., 2012; Masters et al., 2016). Selwyn (2012) described social media as having the potential to deliver major educational change as social media is apparently changing learner's relationships with information and knowledge. This technology enhanced 'new culture of learning' is based around collaborative exploration, play and innovation (Thomas & Brown, 2011). It should be acknowledged that teaching and learning strategies, technology

platforms, educational resources, media formats, content licensing, distribution channels, etc. are all distinct, all important and all related, yet not the same. These somewhat similar platforms with multiple resources can be challenging to distinguish from one another.

Contextualizing general social media use; it is estimated that over 90% of internet users have at least one social media account with almost all of these accounts accessed within the last month. Cheston, Flickinger & Chisolm (2013) reported in their systematic review on social media use in medical education, that social media significantly prompted learner engagement and subsequently also professional development. Masters et al., (2016) echoed Cheston and colleagues (2013) by reporting a high degree of learner autonomy being associated with learning using mobile devices and social media. It was stated that social media is emerging as a field of scholarship, particularly in medical education. Although very few studies have evaluated the direct impact of learning via social media on practitioner competence (McGowan et al., 2012), social media is proving to be an effective method for medical professionals to keep up to date and share newly acquired knowledge (Bahner et al., 2012; McGowan et al., 2012; Von Muhlen & Ohno-Machado, 2012).

The first formal measures of social media use amongst emergency medicine providers was during the International Conference on Emergency Medicine (ICEM) in 2012 (Spiegel, Johnston, Ercleve & Nickson, 2014). Here 409 active Twitter users made 4633 tweets that had an impression level of 8,340,748 (Spiegel et al., 2014). The impression level of a post on Twitter indicates how many times the tweet was viewed, meaning read, quoted or shared (Union Metrics Support, 2017). Impressions levels count every interaction with the tweet as individual even if made by the same user. Although difficult to formally validate a Twitter impression level, it does indicate the breadth of the audience that is theoretically reached. A similar conference held in 2015, the Social Media and Critical Care (SMACC) conference, had 2000 attendees, 5113 active Twitter users who made 79,911 tweets and that left 126,718,308 impressions (Spiegel et al., 2014; Cevik et al., 2016). Distribution of information via social media enables rapid dissemination of educational material and expert insights (Cadogan, Thoma, Chan & Lin, 2014). With the information available publically, professionals are able to individualise their learning; according to their educational needs and interests, and in their own time (Scott et al., 2014). This is echoed by the principles that OER endorse. Larsen and Vincent-Lancrin (2016) stated that when users are freely revealing their knowledge and thus working cooperatively, the innovation impact is greater because it shared. The use of internet technologies, social media and the web appears to be a reasonable application to enhance information sharing. Goldie (2016) affirmed what Siemens (2005) introduced with his emerging educational theory, connectivism, and that it can be applied as a lens through which teaching

and learning in the digital age can be better understood. Information correctly applied translates into knowledge and if the information distributed via FOAMed can be appropriately interpreted and applied, healthcare professionals and their patients could benefit (Cheston, Flickinger & Chisolm, 2013).

Features of FOAMed include sharing of educational resources globally, the use of the web, connectivity, accessibility, encouraging asynchronous learning and allowing clinicians to gather knowledge and experiences via global discussion networks (Radecki, 2014; Nickson & Cadogan, 2014; Leeuwenburg & Parker, 2015; Bartolomé, 2008). Underpinning FOAMed is an ethos of community of practice and willingness to share information. Lave and Wenger (1991) mention that the autonomous, practitioner-orientated, familiarity and cross boundary characteristics of a community of practice is what makes it fit for sharing and retaining knowledge. New technologies are extending the reach of communities of practice and professional interactions beyond traditional communities and geographical boundaries (Wenger, 2011). Some of these characteristics are paralleled by FOAMed. In particular, FOAMed has showed exponential benefit to especially rural medical professionals as time constraints associated with attending traditional CPD activities could potentially be mitigated by the affordances that FOAMed offer (Folkl, Chan & Blau, 2016; Leeuwenburg & Parker, 2015). FOAMed resources shared on social media are open to a sort of forum and non-conventional '*live or real-time peer-review*' by experts in the field thus enhancing the trustworthiness and credibility of these resources (Chan et al., 2016; Folkl et al., 2016). Healthcare professionals using FOAMed are reporting that this real-time (often even synchronous discussion) with global peers is positively influencing their confidence (Folkl et al., 2016; Leeuwenburg & Parker, 2015; Cevik et al., 2016). Many traditional continuing professional development routes like upskilling events, short courses and conferences do not provide these contemporary concepts that FOAMed can (Leeuwenburg & Parker, 2015).

As mentioned in section 1 CPD is a requirement instituted by the national health professions regulatory board for healthcare providers in South Africa and refers to any activities that support lifelong learning and enhancing competence (Forsetlund et al., 2009; Lessing & De Witt, 2007). Enhanced competence hopes to affect the attitude of the medical practitioner and foster the quality of becoming a lifelong learner (Lessing & De Witt, 2007). These characteristics are fundamental to being an adult learner (Knowles, 1975) and later a critical thinker and self-directed learner (Slater & Cusick, 2017). Ultimately, CPD activities should improve knowledge, develop excellence by means of competence and enhance professional growth (Lessing & De Witt, 2007). Anecdotal experiences remain that emergency care providers are reluctant to attend CPD events which result in practicing emergency care

providers and their patients not benefitting from the most up to date clinical knowledge and patient care.

Technology is being embraced as a learning tool and has evolved past traditional 20th century teaching methods. Due to constantly competing demands on today's healthcare professionals, they are reliant on the web and technology to obtain information and current literature (Bahner et al., 2012; Melvin & Chan, 2014; Cheston et al., 2013; Roland & Brazil, 2015; Masters et al., 2016). Masters and colleagues (2016) highlighted how it has become apparent that mobile technologies have become a standard tool in everyday life for most of the general population. Medical education delivery is following suit by progressively evolving from lectures to becoming podcasts, textbooks to becoming e-books and pharmacopeias, web based applications (Bahner et al., 2012; Forgie, Duff & Ross, 2013; Cheston et al., 2013; Roland & Brazil, 2015). Traditional learning styles are being adopted to support the use of these new-age resources, such as podcasts, (Boulos, Maramba & Wheeler, 2006; Forgie, Duff & Ross, 2013; Cheston et al., 2013; Roland & Brazil, 2015) which implies that educators need to adapt delivery of education to suit the needs of their audiences (Masters et al., 2016). Improved learner engagement, collaboration, professional development and positive learner satisfaction all emerged as prospects provided by learning via social media (Cheston et al., 2013; Abate, Gomes & Linton, 2011; Dinh et al., 2011). Adapted and technology enhanced learning has relevance in the context of the study being presented in this assignment, which has focused on CPD as a learning activity for healthcare providers. The assumption exists that if CPD activities are easily accessible, healthcare providers are more likely to maintain current with the latest medical knowledge and treatment guidelines (Forsetlund et al., 2009).

Staying current with medical knowledge and treatment guidelines means that content would require regular revision, amendment and updating. This can present numerous challenges when it is being done on an individual course by course basis. FOAMed provides opportunities in this regard because by its very nature it is constantly being updated and renewed (Nickson & Cadogan, 2014; Roland & Brazil, 2015; Cevik et al., 2016). However, the relevance, quality and accuracy of its' content needs to be evaluated. To date, two studies have evaluated curriculum content covered with FOAMed resources and they yielded similar results. Both of the studies concluded that FOAMed should not be used as the only resource in undergraduate studies, but rather used to supplement existing knowledge (Stuntz & Clontz, 2016; Sinton et al., 2016). Both of the studies reported imbalanced and incomplete coverage of undergraduate curriculum content by FOAMed resources, but agreed that FOAMed could be valuable as a supplement to traditional learning (Stuntz & Clontz, 2016; Sinton et al., 2016).

Bahner et al., (2012) developed a curriculum supplement that was distributed daily to a student cohort via Facebook and Twitter for the duration of one year. The curriculum supplement was reviewed retrospectively by means of a survey. The feedback received by most participants (88.9%) was described as *excellent*. Although this is self-reporting by participants and formal evaluation of the project would be needed, the project revealed the potential that social media demonstrated to be used as a supplement or to enhance traditional educational methods. In other literature where social media was incorporated into traditional education methods there has been positive feedback such as individualised learning opportunities (Forgie et al., 2013; Scott et al., 2014), dissemination of information beyond geographical borders, real-time and active learning from global experts (Scott et al., 2014), easy and timeous access, cost effectiveness, widespread applicability (Bahner et al., 2012; Roland & Brazil, 2015) and opportunities for collaborative learning (Cheston et al., 2013). These studies indicate that learning via social media, and thus FOAMed, has potential for implementation as an alternative or additional educational tool.

As evidenced by the two studies that evaluated curricular coverage by FOAMed resources, FOAMed resources alone were inadequate to provide complete coverage of undergraduate curricula, but it does have a place as a supplement to the traditional curriculum. No studies have evaluated this in the context of a South African based course. This study will retrospectively review FOAMed resources and determine how many of the (postgraduate) AEA-refresher course outcomes (Addendum B) could be covered using FOAMed resources. If it can be shown that FOAMed posts are able to fully or partially cover the AEA-refresher course outcomes this study has the potential to inform future practice in the delivery of the AEA refresher course, i.e. alternative teaching and learning events, such as blended learning with FOAMed resources as a supplement to foundational course content.

3. EXTENDED METHODS SECTION

In this study, a retrospective content analysis method was utilized to review FOAMed resources, posted within a 2-month period for their ability to cover the outcomes of the AEA-refresher course. A similar retrospective research method was effectively utilized recently by Neville (2017) when he reviewed social media and professionalism. Content analysis is innate to communication and an important research technique in social sciences. It makes sense of what is mediated between people, messages, information, media content and technology (Krippendorff, 2004). This resonates with Downes (2012) and Goldie's (2016) interpretations of the conceptual framework of connectivism and distributive learning originally presented by

Siemens (2005). The most common sources of data for content analysis is written text to which an encoded value/meaning is then ascribed. Content analysis as methodology lends itself to bridge between the traditional qualitative and quantitative methods of research (Krippendorff, 2004; Duriau, Reger & Pfarrer, 2007, Vaismoradi, Turunen & Bundas, 2013). The qualitative information presented by each of the FOAMed resources were systematically analysed into themes (relating to the AEA-refresher course outcomes – see Addendum B). These themes were finally reported as a percentage (frequency) to which each covered the overall course outcomes.

The research paradigm that underpinned this study was largely an interpretivist one. The interpretivist approach to research has the intention of understanding human experiences, socially constructed realities and the impact of their own experiences and background on the research (Mertens, 2007; Creswell, Clark, Gutmann, & Hanson 2003). The interpretivist paradigm is classed with the constructivist researcher and they often rely on mixed qualitative and quantitative research methods. In this study, quantitative reporting of frequency expands on the qualitative descriptions (themes) of the data.

Research question

To what extent do existing FOAMed resources cover the required course outcomes for the Ambulance Emergency Assistant refresher course?

The objectives of the study were to:

- Determine the extent to which available FOAMed resources can be used to supplement the outcomes for successful completion of the AEA-refresher course.
- Provide valuable information that could inform recommendations for future practice in the delivery of the AEA refresher course, i.e. supplementing the existing curriculum or alternative teaching and learning events, such as blended learning.

Data collection

The data was obtained from FOAM EM (http://www.foamem.com). This site is an aggregator of headlines from multiple sites and feed them directly to a single website. The FOAM EM website is a curator site for all #FOAMed posts. This means that all posts (including published articles, blogs, podcasts, videos, etc.) with the tagged *'#FOAMed'* characteristic link directly to the site in real time. This was beneficial as the researcher did not have to manually search

for new daily content and was a suitable way to ensure that no correctly tagged FOAMed posts were overlooked during the data collection period. The FOAM EM site relies on contributors to FOAMed to correctly tag their resources. The researcher was subscribed to the FOAM EM website and received a daily email with the links to the original FOAMed posts. An email account was created for the purpose of collating the information. At the time of data collection, the feed from FOAM EM was collating posts from over 250 FOAM sites (http://www.foamem.com/about/) which represented about 70% of all known contributing FOAMed websites. According to Cadogan (2016) in March 2016, 356 websites were listed as FOAMed contributors. Although alternative to the traditional online library search, using the FOAM EM site was the most suited data collection tool for #FOAMed resources on social media. All resources posted to the website from 01 March to 30 April 2017 were reviewed and interpreted against predetermined inclusion criteria.

All resources that were deemed relevant to the AEA capabilities, available in English, without restriction (available in full) and for free were included in the study. The inclusion criteria were selected based on the following:

- relevance to the AEA capabilities
- the primary language of the researcher
- time constraints present during the study
- supporting the FOAMed concept of free information.

As previously mentioned, the AEA capabilities are dictated by the HPCSA. An outline for delivery of the AEA-refresher course is provided by the HPCSA to educational institutions in South Africa; however the specific course outcomes are at the discretion of the training institution (HPCSA, 2015). The AEA-refresher course outcomes used as reference criteria for this study (Addendum B) were adapted by the researcher from a course facilitator guide at the training institution in South Africa where the researcher was employed at the time of this study.

Data Interpretation and Analysis

A process of content analysis was used to analyse each of the 441 collected FOAMed posts. All collected posts underwent the following three step process of analysis: [1] the resource title was viewed and included or excluded based on the AEA capabilities (Addendum A) and inclusion criteria, [2] included resources were fully read / listened to / viewed (depending on the type of resource, i.e. blog, podcast, video, etc.) and matched to coded themes 1-17 (Addendum B). [3] Lastly, resources were categorized by medical competency domains (knowledge, skill or attitude) and Bloom's Taxonomy cognitive domain (Bloom et al., 1956)

[see Figure 1]. The medical competency domain was selected based on the researcher's interpretation of knowledge (i.e. theoretical information), skill (i.e. intravenous cannulation or chest compressions during CPR) or attitude (i.e. communication with a patient). The Bloom's Taxonomy cognitive domain was categorised based on the descriptive words provided for each hierarchical level as seen in figure 1. The stepwise approach applied to each of the collected posts and drew on some of the methodological framework processes applied in a scoping review (Arksey & O'Malley, 2007). Table 2 depicts the three-step process of data analysis. In addition, the type of media for each resource was recorded. The rationale for the inclusion of this information was that, if the type of media is known, wider audiences could be reached by appropriately including the various types of media to suit different types of leaners, i.e. auditory, visual or kinaesthetic (Fleming, 2001).

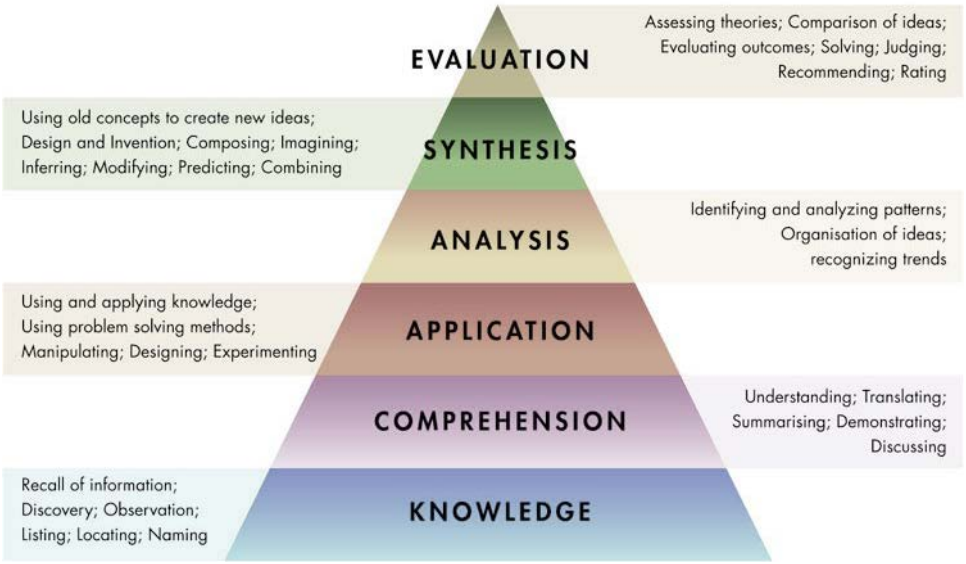


Figure 1. Bloom's Taxonomy http://gk.ronbassett.com/wp-content/uploads/2016/02/blooms_taxonomy.jpg

Table 2. Depiction of the three step data analysis process.

Step 1	Step 2	Step 3
Collected post obtained via email.	Resource full read / listened to / watched, matched to coded themes 1-17.	Categorized by medical competency and Blooms Taxonomy cognitive domain.


English – FOAM EM RSS
FOAMEM English
To: Judy.foamed@gmail.com,
Reply-To: English – FOAM EM RSS

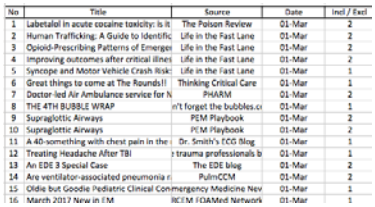
FOAMEM English

- What's Wrong With My Patient? Part 2
- What's Wrong With My Patient?
- CRACKCast E073 – Asthma

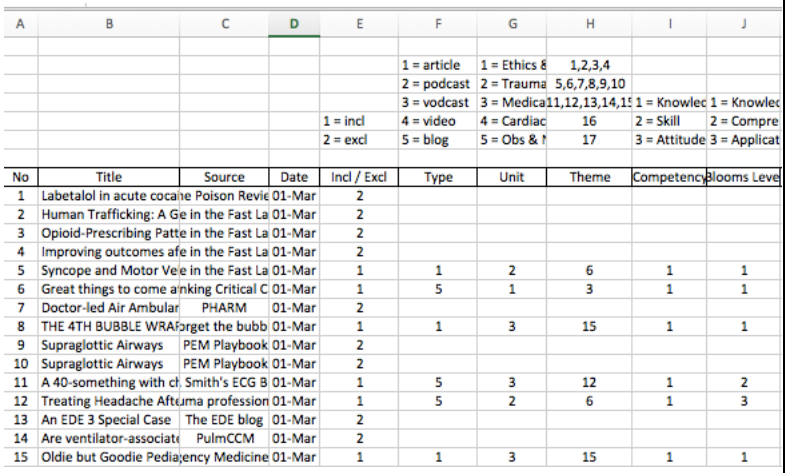
What's Wrong With My Patient? Part 2

Posted: 28 Apr 2017 07:01 AM PDT

Recorded into Microsoft Excel®



No	Title	Source	Date	Incl / Excl
1	Labetalol in acute cocaine toxicity: is it	The Poison Review	01-Mar	2
2	Human Trafficking: A Guide to Identific	Life in the Fast Lane	01-Mar	2
3	Opioid-Prescribing Patterns of Emerger	Life in the Fast Lane	01-Mar	2
4	Improving outcomes after critical illnes	Life in the Fast Lane	01-Mar	2
5	Syncope and Motor Vehicle Crash Risk	Life in the Fast Lane	01-Mar	1
6	Great things to come at The Rounds!!	Thinking Critical Care	01-Mar	1
7	Doctor-led Air Ambulance service for N	PHARM	01-Mar	2
8	THE 4TH BUBBLE WRAP	n't forget the bubbles.c	01-Mar	1
9	Supraglottic Airways	PEM Playbook	01-Mar	2
10	Supraglottic Airways	PEM Playbook	01-Mar	2
11	A 40-something with chest pain in the	Dr. Smith's ECG Blog	01-Mar	1
12	Treating Headache After TBI	trauma professionals b	01-Mar	1
13	An EDE 3 Special Case	The EDE blog	01-Mar	2
14	Are ventilator-associated pneumonia r	PulmCCM	01-Mar	2
15	Oldie but Goodie Pediatric Clinical Con	mergency Medicine Nev	01-Mar	1
16	March 2017 New in EM	REM FOAMed Network	01-Mar	1



A	B	C	D	E	F	G	H	I	J
					1 = article	1 = Ethics &	1,2,3,4		
					2 = podcast	2 = Trauma	5,6,7,8,9,10		
					3 = vodcast	3 = Medica	11,12,13,14,15	1 = Knowlec	1 = Knowlec
				1 = incl	4 = video	4 = Cardiac	16	2 = Skill	2 = Compre
				2 = excl	5 = blog	5 = Obs & M	17	3 = Attitude	3 = Applicat
No	Title	Source	Date	Incl / Excl	Type	Unit	Theme	Competency	Blooms Level
1	Labetalol in acute coca	ne Poison Revie	01-Mar	2					
2	Human Trafficking: A Gu	e in the Fast La	01-Mar	2					
3	Opioid-Prescribing Patte	in the Fast La	01-Mar	2					
4	Improving outcomes afte	in the Fast La	01-Mar	2					
5	Syncope and Motor Ve	e in the Fast La	01-Mar	1	1	2	6	1	1
6	Great things to come a	nking Critical C	01-Mar	1	5	1	3	1	1
7	Doctor-led Air Ambular	PHARM	01-Mar	2					
8	THE 4TH BUBBLE WRAP	orget the bubb	01-Mar	1	1	3	15	1	1
9	Supraglottic Airways	PEM Playbook	01-Mar	2					
10	Supraglottic Airways	PEM Playbook	01-Mar	2					
11	A 40-something with ch	Smith's ECG B	01-Mar	1	5	3	12	1	2
12	Treating Headache Afte	ma profession	01-Mar	1	5	2	6	1	3
13	An EDE 3 Special Case	The EDE blog	01-Mar	2					
14	Are ventilator-associate	PulmCCM	01-Mar	2					
15	Oldie but Goodie Pedia	ency Medicine	01-Mar	1	1	3	15	1	1

All data resources were collected, sorted, analysed and recorded into a Microsoft Excel® spread sheet by the researcher (Addendum C represents a section of recorded data). Assistance was sought for the basic statistical analysis of the information from the research department where the researcher is employed. Confidence intervals were calculated using traditional methods.

Quality Assurance

The concept of FOAMed is critiqued because it is not conventionally peer reviewed prior to publication, however lately it is debated that the reliability of FOAMed resources is increasing with interactions they receive via social media and an 'open' peer review process (Weingart & Faust, 2014; Thoma et al., 2015b; Trueger & Schringer, 2016; Chan et al., 2016). Chan and colleagues (2016) are using the Approved Instructional Resources (AIR) score as an instrument to critically appraise online content of FOAMed resources. The AIR score is currently a novel scoring system that assigns a certification of quality to social media content (Lin et al., 2016). Although the rating systems do improve quality assessment of FOAMed, further research is required to find an optimal rating score (Chan et al., 2016). [See Addendum D for the AIR score instrument]. FOAM EM endorses the quality principles that the previously mentioned SMi and AIR-score represent (Thoma et al., 2015b; Chan et al., 2016). High quality medical education research should bear characteristics that evidence trustworthiness

(credibility), applicability and consistency (Frambach, Van der Vleuten, Durning, 2013). Credibility was maintained by collecting data for more than a single month from a credible source of FOAMed resources. Consistency and exact transferability of the results cannot be guaranteed due to the nature of FOAMed being that trending topics periodically vary; however, the results do have the potential to be applied in various contexts of medical education.

Ethics approval was not required for this study as no primary participants were involved and all the data used was publically available.

Study Limitations

The researcher acknowledges that the analysis of data was based solely on her understanding and interpretation of the AEA capabilities and the AEA-refresher course outcomes. The results serve as the first step in a process towards informing alternative delivery of the AEA-refresher course and should ideally be reviewed by another or multiple other professionals in the field. In addition, exact transferability of results may vary as FOAMed does not deliver the exact same topic coverage month-to-month, instead trends in topics with the most recent updates or changes. Furthermore, topics relevant to the AEA-refresher course outcomes may have been missed during data collection due to the FOAM EM site relying on contributors to correctly tag their resources with the *'#FOAMed'* characteristic. To date no available studies have evaluated the trends of FOAMed posts since its origin in 2012. This retrospective review only analyzed FOAMed posts available in the English language during a short 2-month period. The AEA-refresher course is presented only in English, thus FOAMed posts in other languages would not be included in the delivery of the course and due to time constrains associated with the study, only a 2-month data collection period was possible. Review of FOAMed resources over a longer period of time will most likely provide a more balanced cover of the AEA-refresher course outcomes.

4. THE MANUSCRIPT

[Prepared for publication in the *African Journal of Health Professions Education*]

A retrospective content analysis of the Ambulance Emergency Assistant refresher course outcomes as covered by Free Open Access Medical Education (FOAMed) resources

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Background: Continuous professional development (CPD) is a requisite for all healthcare professionals in South Africa. The shift-driven work environment of pre-hospital care providers often makes attending CPD events logistically impractical. Free open access medical education (FOAMed) and online learning could make CPD activities more accessible.

Objective: The objective of the study was to determine to what extent available FOAMed resources could be used to supplement the outcomes for successful completion of the Ambulance Emergency Assistant (AEA) refresher course.

Methods: A retrospective content analysis methodology was adopted to review FOAMed resources posted within a 2-month period for their ability to cover the outcomes of the AEA-refresher course. Data was subject to a three-step process of content analysis that was matched to 17 identified AEA-refresher course outcomes (themes). The FOAMed resources (qualitative data) matched to the course outcomes were converted into quantitative data (the frequency of the themes).

Results: A total of 441 FOAMed posts were reviewed during a 2-month period. Of the 441 posts, 61% (269) were excluded based on not being related to the AEA capabilities. Thus, the remaining 39% (172) FOAMed posts were relevant to cover the 17 identified themes of the AEA-refresher course. The two most frequently observed themes were related to (a) professionalism with 45 (26.2%) posts and (b) general other medical emergencies with 39 (22.7%) of the posts. The remaining 15 themes all had up to 8% representation respectively.

Conclusion: The study has highlighted the potential of FOAMed resources to supplement the delivery of CPD events, like the AEA-refresher course. However, given that the outcomes were unequally represented, educational institutions wishing to make use of FOAMed to supplement delivery should be aware of the affordances that FOAMed can offer with due caution given to the residual critiques and limitations of FOAMed.

INTRODUCTION

Free open access medical education (FOAMed) is a term that has become highly established in the emergency services community. [1-4] The term is well recognized as a collection of freely available educational material and online information and since its conception in 2012, many websites have emerged and become well known as reliable contributors to FOAMed. [4] FOAMed has since also been evolving as a model to support continuing professional development (CPD). [1,2] FOAMed resources are easily accessible and portable which make it ideal for healthcare professionals to educate themselves when it best suits their schedules. FOAMed resources are distributed via various social media platforms as podcasts (audio), vodcasts (video) and blogs (article) and is believed that FOAMed has the potential to shorten the knowledge transition gap between inception, publication and bedside application. [2,5] Not only is the prediction that new and updated medical modalities could be implemented at the patient's bedside sooner, embraced internet technologies and social media learning could enhance the dissemination of peer-reviewed medical knowledge faster and with potentially improved accuracy. [3,4,6]

Over the past two decades, technology has increasingly been influencing the way that we live, communicate and learn. [7] In particular, the internet technologies and social media have become powerful tools for the distribution of medical knowledge allowing its users to access information when, where and how they want to. [1] This has created opportunities for new ways in which learning can be facilitated and could even provide alternative means to facilitate CPD activities. Social media is also emerging as a field of scholarship in medical education offering many opportunities for innovation. It is reported that learner engagement, collaboration and professional development all transpired as opportunities provided by learning via social media. [7] There have been studies evaluating learning via social media interventions most returning with positives like individualized learning opportunities, increased learner satisfaction, widespread applicability, accessibility, timeous and cost effectiveness. [8-10] To date, two studies have specifically evaluated curriculum content covered with FOAMed resources and they yielded similar results. These studies both concluded that FOAMed should not be used as the only resource in undergraduate studies, but rather used to supplement existing knowledge and traditional learning. [11-12] Their reason for this recommendation was the finding of imbalanced and incomplete coverage of undergraduate curriculum content by FOAMed. [11-12]

The healthcare profession is dynamic in that it is ever evolving and changing. [1-2, 13] Technologic advances, globalisation and changes in the world's health needs represent only a few motives as to why healthcare professionals need to be lifelong learners and continue professional development. [3] Working in an emergency care setting requires that providers remain current and competent in life-saving interventions like resuscitation and trauma care. This notion is supported by resuscitation and trauma organizations worldwide where new and updated guidelines are released every 5 years. [1] These guidelines provide practicing emergency care providers with the latest recommended evidence based medicine and best practice treatment strategies. Staying up to date with the ever-evolving world of emergency care is essential to ensure that the best quality care is delivered to patients. Working in a shift-driven environment often poses a challenge to emergency care providers to find the time to stay up to date with the latest recommended medical care. Emergency care providers, like most healthcare professionals, are required to attend continuous professional development (CPD) activities to maintain knowledge and skills. CPD refers to any activities that support lifelong learning and enhancing the competence (knowledge, attitudes and skills) of medical practitioners. [14-15] One way in which CPD is addressed in the medical profession is through conferences, [14] however a recently published article in the USA reported that on average only 25% of medical residents were able to attend conferences with significant late arrivals and requests to leave early. [16] Although not specifically referring to emergency care providers, medical residents comparably work in a shift driven environment. This may be an indication for the need of more flexible or alternative means of delivering CPD events in the medical profession.

In South Africa, CPD is a requirement instituted by the national health professions regulatory board, the Health Professions Council of South Africa (HPCSA). This is applicable to all healthcare professionals in South Africa, including Ambulance Emergency Assistants (AEA). AEA practitioners fall into the middle (intermediate) level of the emergency care provider hierarchy in South Africa. Practitioners are strongly encouraged by the HPCSA to maintain current with CPD compliance as quality assurance is maintained with random audits and deregistration or monetary fines could apply if non-compliance is found. [17]

The AEA-refresher programme was selected for the purpose of this study as this is a programme that the researcher was actively involved in teaching at the time of this study thus

was thoroughly familiar with AEA course outcomes and the AEA capabilities (as specified by the HPCSA). The AEA provider capabilities include a broad range of emergency care capabilities that provides a wider range then the basic practitioner and timeously feasible compared to the advanced practitioner capabilities. The AEA capabilities are dictated by the HPCSA [17] and the most common CPD activity available to AEA practitioners is the AEA-refresher course. This 5-day classroom based course (accredited by the HPCSA) aims to provide the practitioner with revision of knowledge gained during their original training, opportunity to practice skills not commonly used in everyday practice and inform the practitioners of any treatment guideline updates and/or changes. As mentioned earlier, maintaining knowledge and skill with regard to the latest recommended treatment guidelines and to adhere to quality assurance mechanisms, CPD is crucial to these practitioners. AEA practitioners are expected to achieve cognitive educational objectives appropriate to the first three levels of Bloom's Taxonomy. These are knowledge, comprehension and application. [18] Bloom's Taxonomy is a hierarchical model used to classify educational learning objectives into levels of complexity. [18] AEA practitioners should not only know and understand the fundamentals of emergency care, but have the ability to apply this to their practice. Anecdotal evidence suggests that the AEA-refresher course is not well attended by many practitioners due to constraints like time off work, travel to and accommodation at education institutions. If this is in fact true, it is potentially to the detriment of the patient if these practitioners are not current with the latest treatment recommendations and guidelines. It can be argued that in this context FOAMed resources can play a role. As previously mentioned these resources are easily accessible, portable and have the potential to speed up bedside application of updated and new medical modalities. To effectively use FOAMed resources as a potential supplement to the traditional delivery of the AEA-refresher course, however, it must first be known to what extent FOAMed is able to cover the required course outcomes.

METHODS

Study Design and Setting

This study utilized a retrospective content analysis methodology [19] applied to review FOAMed resources posted within a 2-month period for their ability to cover the outcomes of the AEA-refresher course. Content analysis is innate to communication and an important research constituent in social sciences as it attempts to make sense of what is mediated between

information, media content and technology. [19] The most common sources of data for content analysis is written text to which an encoded value/meaning is then ascribed. Content analysis as methodology lends itself to bridge between the traditional qualitative and quantitative methods of research. [19-20] For the purpose of this study a content analysis was appropriate as it allowed the researcher to exchange the qualitative data (themes) into quantitative data (counting the frequency of the themes).

The data for this study was obtained from FOAM EM. [21] The site is an aggregator of headlines from multiple sites and feed them directly to a single website. The FOAM EM website is a curator site for all #FOAMed posts. This means that all posts (including published articles, blogs, podcasts and videos) with the *'#FOAMed'* characteristic link directly to the site in real time. This was beneficial as the researcher did not have to manually search for new daily content and a suitable way to ensure that no correctly tagged FOAMed posts were overlooked during the data collection period. At the time of data collection, the feed from FOAM EM was collating posts from over 250 FOAM sites [21] which represented about 70% of all known contributing FOAMed websites. According to Cadogan in March 2016, 356 websites were listed as FOAMed contributors. [22] All resources posted to the website from 01 March to 30 April 2017 were reviewed. It should be acknowledged that the FOAM EM site relies on FOAMed contributors to correctly tag their resources.

All resources posted during the 2-month study period in English (primary language of the researcher), without restriction and for free (supporting the FOAMed concept) were included in the study. Resources were excluded if the resource content extended beyond the capabilities of the AEA practitioner (as described by the AEA-refresher course outcomes) or duplicate posts.

Ethics approval was not required for this study as no primary participants were involved and all the data used was publicly available.

Data collection and analysis

A subscription email account was used to access the FOAMed posts. The researcher received a daily email with links to all newly published FOAMed posts. In keeping with the selected approach of content analysis, each of the collected FOAMed posts were reviewed to determine

relevance of it to cover the required 17 outcomes of the AEA-refresher course (see table 1 - themes). The following diagram (Figure 1) represents the initial sorting that each of the resources underwent after being received via email, up to inclusion for analysis.

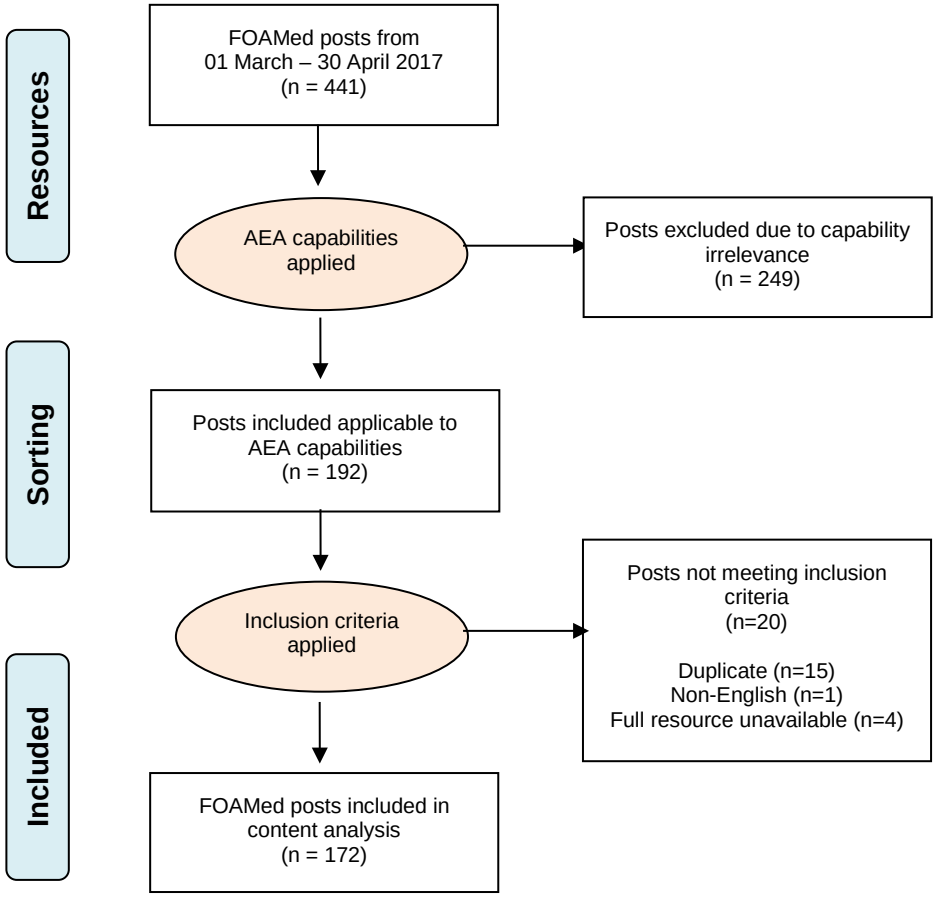

Figure 1. Flow diagram of initial resource sorting and review of all FOAMed posts published from 01 March to 30 April 2017.

All 441 collected FOAMed posts underwent the following three step process of analysis: (1) the resource title was viewed and included or excluded based on the AEA capabilities and inclusion criteria, (2) included resources were fully read / listened to / viewed (depending on the type of resource, i.e. blog, podcast, video, etc.) and matched to coded themes 1-17. (3) Lastly, resources were categorized by medical competency and Bloom's Taxonomy cognitive domain. [18] In addition, it was recorded which media type each resource represented. This could be useful to know when alternative educational strategies (i.e. blended or online learning activities) are prepared. If the type of media is known, wider audiences could be addressed by appropriately including the various types of media to suit different types of leaners, i.e. auditory or visual. This in turn can positively contribute to learning via social media and utilizing

FOAMed by resources being available in various forms and when it best fits into the practitioners' logistical demands of everyday life.

All data resources were collected, sorted, analysed and recorded into a Microsoft Excel® spread sheet by the researcher. Assistance was sought for the basic statistical analysis of the information from the research department where the researcher is employed. Basic statistic functions in Microsoft Excel® were utilized to convert the themed information into quantitative data (percentages). Confidence intervals were calculated using traditional methods.

Quality assurance

FOAMed is often critiqued because it is not conventionally peer reviewed prior to publication, however lately it is debated that the reliability of FOAMed resources is increasing with interactions they receive via social media and its non-conventional and 'open' peer review process. [1, 23-25] Chan and colleagues are using the Approved Instructional Resources (AIR) score as an instrument to critically appraise online content of FOAMed resources. [24] The AIR score is currently a novel scoring system that assigns a certification of quality to social media content. [26] Although the rating systems does improve quality assessment of FOAMed, further research is required to find an optimal rating score. [24] The FOAM EM site endorses the quality principles that the AIR-score represent. [23-25]

The resources included in the study accurately represent the AEA scope of practice and the course outcomes as the researcher is particularly familiar with the AEA qualification. The researcher held the AEA qualification for two years in 2008-2009 and was actively involved in teaching the course between 2014 and 2017.

RESULTS

A total of 441 FOAMed posts were reviewed during the study period. Of the 441 posts, 61% (269) were excluded due to mostly being irrelevant or extended beyond the AEA capabilities. Thus, the remaining 39% (172) FOAMed posts were relevant to cover the 17 identified outcomes of the AEA-refresher course. *Table 1* demonstrates an aggregated representation of

the 17 AEA-refresher course outcomes and the corresponding FOAMed coverage of these outcomes.

Table 1. AEA-refresher course outcomes covered by FOAMed

Theme (based on course outcomes)	Total posts per theme/Total posts = % Total Posts (95% = CI)
Ethics in the EMS	8/172 = 4.65 (1.5 - 7.8)
Child and elder abuse	-
Professionalism (characteristics of a professional, documentation, professional well-being)	45/172 = 26.16 (19.59 - 32.73)
Law (patient rights, regulatory bodies)	2/172 = 1.16 (-0.44 - 2.76)
Haemorrhagic-, anaphylactic- and neurogenic shock	5/172 = 2.91 (0.4 - 5.42)
Concussion, closed head injuries (RICP), base of skull fracture and neuroprotective strategies	4/172 = 2.33 (0.08 - 4.58)
Open pneumothorax, tension- and pneumothorax, hemothorax, flail chest and cardiac tamponade	3/172 = 1.74 (-0.21 - 3.69)
Spinal Injuries, spinal motion restriction	4/172 = 2.33 (0.08 - 4.58)
Limb & pelvic fractures, amputations, rhabdomyolysis, the use of tourniquets	8/172 = 4.65 (1.5 - 7.8)
Burns (types and severity)	2/172 = 1.16 (-0.44 - 2.76)
Asthma, chronic obstructive pulmonary disease (COPD) and pneumonia	13/172 = 7.56 (3.61 - 11.51)
ACS (myocardial infarction and angina), chest pain, heart failure and 3-lead ECG review	11/172 = 6.40 (2.74 - 10.06)
Seizures and cerebrovascular attack (CVA)	9/172 = 5.23 (1.9 - 8.56)
Hypoglycaemic emergencies, DKA, abdominal emergencies, other medical emergencies	39/172 = 22.67 (16.41 - 28.93)
Epiglottitis, croup and dehydration in paediatrics	9/172 = 5.23 (1.9 - 8.56)
Resuscitation (shockable and non-shockable arrest), PCA management and declaration of death	9/172 = 5.23 (1.9 - 8.56)
Placenta Previa, placenta abruptio, PPH, pre-eclampsia, eclampsia, prolapsed cord presentation, breech presentation, new-born care	1/172 = 0.58 (-0.55 - 1.71)
Total	**172/172 = 100**

AEA, Ambulance Emergency Assistant; FOAMed, Free Open Access Medical Education; CI, Confidence interval; EMS, Emergency Medical Services; RICP, Raised intracranial pressure; ACS, Acute coronary syndromes; ECG, Electrocardiogram; DKA, Diabetic Ketoacidosis; PCA, Post-cardiac arrest; PPH, Post-partum hemorrhage

The two most frequently observed themes were relating to professionalism with 45 (26.2%) posts and other general medical emergencies with 39 (22.7%) of 172 posts. There were 7 themes (ethics, limb injuries, respiratory, cardiovascular & neurological emergencies, pediatrics and resuscitation) with average (5-8%) representation and the remaining 8 themes had very low (<3%) representation.

Additional analysis of the FOAMed posts revealed that majority 116 (68%) of posts were in the form of a blog, 136 (79.1%) fell into the knowledge discipline of a medical professional's competency and 108 (62.8%) of the posts were applicable to the third tier (application) of the cognitive Blooms Taxonomy levels. *Figures 2-4* illustrate a complete representation of the additional analysis.

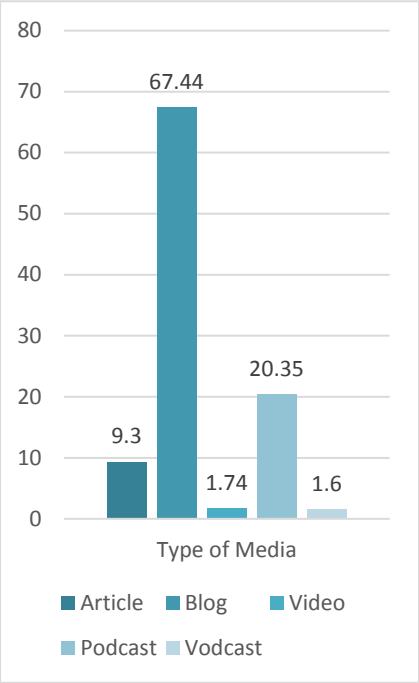

Figure 2

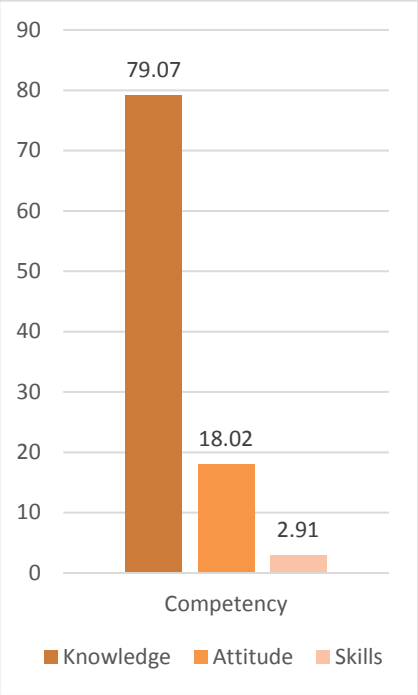

Figure 3

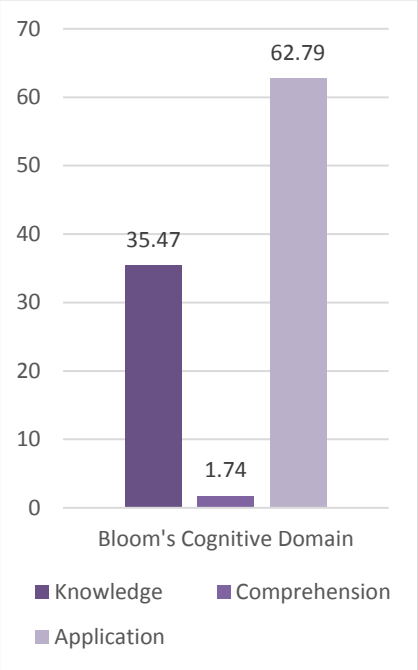

Figure 4

DISCUSSION

The purpose of this study was to determine to which extent available FOAMed resources could be used to cover the outcomes for successful completion of the AEA-refresher course; in the hope that the results could inform alternative teaching and learning events in the delivery of the course. FOAMed is able to suffice as a supplement to foundational knowledge, but could not entirely replace core curricular content in undergraduate or postgraduate courses. FOAMed provides daily posts containing information relating to trending topics in emergency medicine. Trends change as new research and experiences emerge globally. FOAMed has taken the emergency medical care environment by storm with the quantity and quality of information that it provides. [1-4] It would be inane to not embrace the positive impact that FOAMed has, and continues to have, in the emergency care environment.

FOAMed resources were able to provide more than one-third cover of the AEA-refresher course outcomes. The course outcomes were unequally represented by FOAMed resources and just over half of the FOAMed resources were excluded due to extending beyond the AEA practitioners' capabilities (as described by the AEA-refresher course outcomes). The AEA practitioners' capabilities include mostly basic resuscitation with minimal invasive procedures. Their capabilities do not include interventions like advanced airway management, 12-lead ECG

analysis, blood gas analysis and emergency sonography. These are the topics frequently trending among FOAMed posts as most of the major contributors and experts are emergency- and trauma physicians or surgeons. [24] The resources are addressed at a global audience, therefore likely to underrepresent specific course curricula such as the AEA-refresher course.

Professionalism, the topic with the largest cover by FOAMed resources is exceptionally valuable. Clinicians often become overly emerged in clinical information (knowledge and skills) that they disregard their attitude and personal wellbeing. A competent medical professional should possess equal knowledge, attitude and skill. [14-15] It should be reassuring to medical practitioners and employers that FOAMed not only focusses on emergency medical care, but also places emphasis on the individual providing the care. The second largest topic coverage of the AEA-refresher outcome was general medical emergencies. This is equivalently beneficial to AEA practitioners at they are often left to manage patients with non-life threatening medical emergencies independently.

This study further revealed that (i) majority of FOAMed resources reviewed were blogs (written web pages); (ii) contributed knowledge to the overall competence required from healthcare providers and (iii) represented the application tier of Bloom's Taxonomy. [18] The application level of Bloom's Taxonomy represents using and applying knowledge. [18] This appropriately relates to the fact that most of (almost 80%) of the FOAMed resources contributed knowledge to the overall competence of a healthcare provider. Application of knowledge is appropriate to the AEA practitioner, because as previously mentioned, they are required to practice independently and accordingly apply knowledge to their clinical environment. These findings emphasize that FOAMed resources can add value to delivery of the AEA-refresher course.

We cannot discount the infancy in which FOAMed finds itself. Health providers using the information shared on FOAMed must remain aware of its limitations. The biggest critique of FOAMed remains that published information has not been peer-reviewed. The majority of FOAMed users are aware of this and have become familiar with the top rated FOAMed contributors. The creators and renowned FOAMed contributors remain actively involved in improving this community. Daily information is shared on how quality assurance is being improved. [23-25]

Limitations

The researcher acknowledges that the analysis of data was based her understanding and interpretation of the AEA capabilities and how it relates to the AEA-refresher course outcomes. These results serve as the first step in a process towards supplementing delivery of the AEA-refresher course and should ideally be reviewed by another or multiple professionals in the field. In addition, exact transferability of results may vary as the notion of FOAMed doesn't deliver the exact same topic coverage month-to-month, instead trends in topics with the most recent updates or changes. Some resources relevant to cover the AEA-refresher course outcomes may have been missed due to the FOAM EM curator site relying on its contributors to correctly tag their resources. This retrospective review only analyzed FOAMed posts available in the English language during a 2-month period. FOAMed posts in other languages would not be included in the delivery of the AEA-refresher course. In South Africa, the course is presented only in English.

CONCLUSION

This study has highlighted the potential of FOAMed resources to supplement the delivery of the AEA-refresher course. In particular, it appears that the subjects of professionalism and general medical emergencies were well-described in the posts that were trending at the time of analysis. This is suggestive of FOAMed resources not being limited to clinical knowledge only, but includes aspects of practitioner well-being.

However, given that the outcomes were unequally represented, educational institutions wishing to make use of FOAMed to supplement delivery of courses, like the AEA-refresher (or other post-graduate teaching, learning or CPD events) or practitioners wishing to enhance their competencies should be aware of the affordances that FOAMed can offer but with due caution given to the critiques and limitations around FOAMed.

Recommendations for future studies could include review of FOAMed resources over a longer period of time and by multiple researchers. A review of specifically South-African sourced FOAMed contributions may improve the context and applicability of using FOAMed resources as an educational supplement to delivery of CPD events such as the AEA-refresher course. Furthermore, the methodology applied to this study could inform research methods for others

in the research community focusing on the potential connections between technology and the educational environment.

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5. CLOSING COMMENTS

This assignment was built around an article prepared for submission to the African Journal of Health Professions Education (AJHPE). The extended literature review and research methodology sections were included as complements to the article. The study affirmed that FOAMed is able to suffice as a supplement to foundational knowledge, but could not replace core curricular content in CPD events such as the AEA-refresher. FOAMed resources can however be included in delivery of the AEA-refresher course via alternative or online teaching methods with suitable guidance. Furthermore, the methodology applied to this study could inform research methods of others in the research community focusing on the potential connections between technology and the educational environment.

Review of FOAMed resources over a longer period of time and by more than a single researcher will most likely provide a more balanced overview of the AEA-refresher course outcomes.

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LIST OF ADDENDA

Addendum A: AEA capabilities (Scope of Practice)

HPCSA
Health Professions Council of South Africa

HEALTH PROFESSIONS COUNCIL OF SOUTH AFRICA

PROFESSIONAL BOARD FOR EMERGENCY CARE

CAPABILITIES OF EMERGENCY CARE PROVIDERS: JUNE 2011

CAPABILITY	BAA	ILS	CCA/ND	ECT	ECP
Airway Management					
Finger sweep	√	√	√	√	√
Head-tilt-chin lift	√	√	√	√	√
Jaw-thrust	√	√	√	√	√
Suctioning of the airway	√	√	√	√	√
Airway obstruction removal techniques	√	√	√	√	√
Use of Magill's forceps		√	√	√	√
Oropharyngeal airway insertion	√	√	√	√	√
Nasopharyngeal tube airway insertion		√	√	√	√
Cricoid pressure		√	√	√	√
Orotracheal intubation			√		√
Nasotracheal intubation			√		√
Blind nasotracheal intubation			√		√
Digital endotracheal intubation			√		√
Retrograde intubation			√		√
Supraglottic extraglottic airway devices insertion			√	√	√
Orogastric tube insertion			√	√	√
Nasogastric tube insertion			√	√	√
Needle cricothyroidotomy		√	√	√	√
Surgical cricothyroidotomy			√		√
Rapid sequence intubation, only with capnography & ventilator					√

1

LAST UPDATED JULY 2013

Oxygenation and Ventilation					
Oxygen therapy	√	√	√	√	√
Nebulization (medicated)		√	√	√	√
Use of pulse oximetry		√	√	√	√
Needle thoracentesis		√	√	√	√
Bag valve mask ventilation	√	√	√	√	√
Bag valve tube ventilation	√	√	√	√	√
Mechanical ventilation			√		√
Use of PEEP			√		√
Use of capnography			√	√	√

Circulatory Management					
Blood pressure measurement	√	√	√	√	√
Peripheral intravenous cannulation - ≥ 8 year old patients only		√	√	√	√
Peripheral intravenous cannulation - all age categories			√	√	√
External jugular vein cannulation			√	√	√
Femoral vein cannulation			√		√
Intra-osseous insertion			√	√	√
Umbilical vein cannulation			√	√	√
Fluid administration		√	√	√	√
Intravenous drug administration			√	√	√
Intraosseus drug administration			√	√	√
Subcutaneous drug administration		√	√	√	√
Intramuscular drug administration			√	√	√
Endotracheal tube drug administration			√		√
Drug infusions and use of infusion devices			√		√
Use of syringe drivers			√		√
Use of non-invasive blood pressure monitors	√	√	√	√	√
External haemorrhage control including use of tourniquet	√	√	√	√	√
Use of pneumatic anti-shock garment - legs only		√	√	√	√
Use of pneumatic anti-shock garment - entire			√		√
Automated external defibrillation	√	√	√	√	√
Manual defibrillation (asynchronous)		√	√	√	√
Synchronised cardioversion			√		√
Vagal manoeuvres			√		√
Central line management			√		√
Transcutaneous cardiac pacing			√		√
3 Lead ECG monitoring		√	√	√	√
12 Lead ECG monitoring			√		√
Fibrinolysis					√

ECG Rhythm Analysis					
Normal sinus rhythm		√	√	√	√
Sinus bradycardia		√	√	√	√
Sinus tachycardia		√	√	√	√
Ventricular fibrillation		√	√	√	√
Ventricular tachycardia		√	√	√	√
Asystole / PEA		√	√	√	√
All other emergency cardiac dysrrhythmias			√		√

Obstetric Management					
Normal vaginal delivery	√	√	√	√	√
Prolapsed cord management	√	√	√	√	√
Breech delivery management (scope specific)	√	√	√	√	√
Mal presentations management (scope specific)	√	√	√	√	√
Preterm labour management (scope specific)	√	√	√	√	√
Obstructed labour management (scope specific)	√	√	√	√	√
Fundal massage	√	√	√	√	√
Bimanual compression			√		√
Tocolysis			√		√

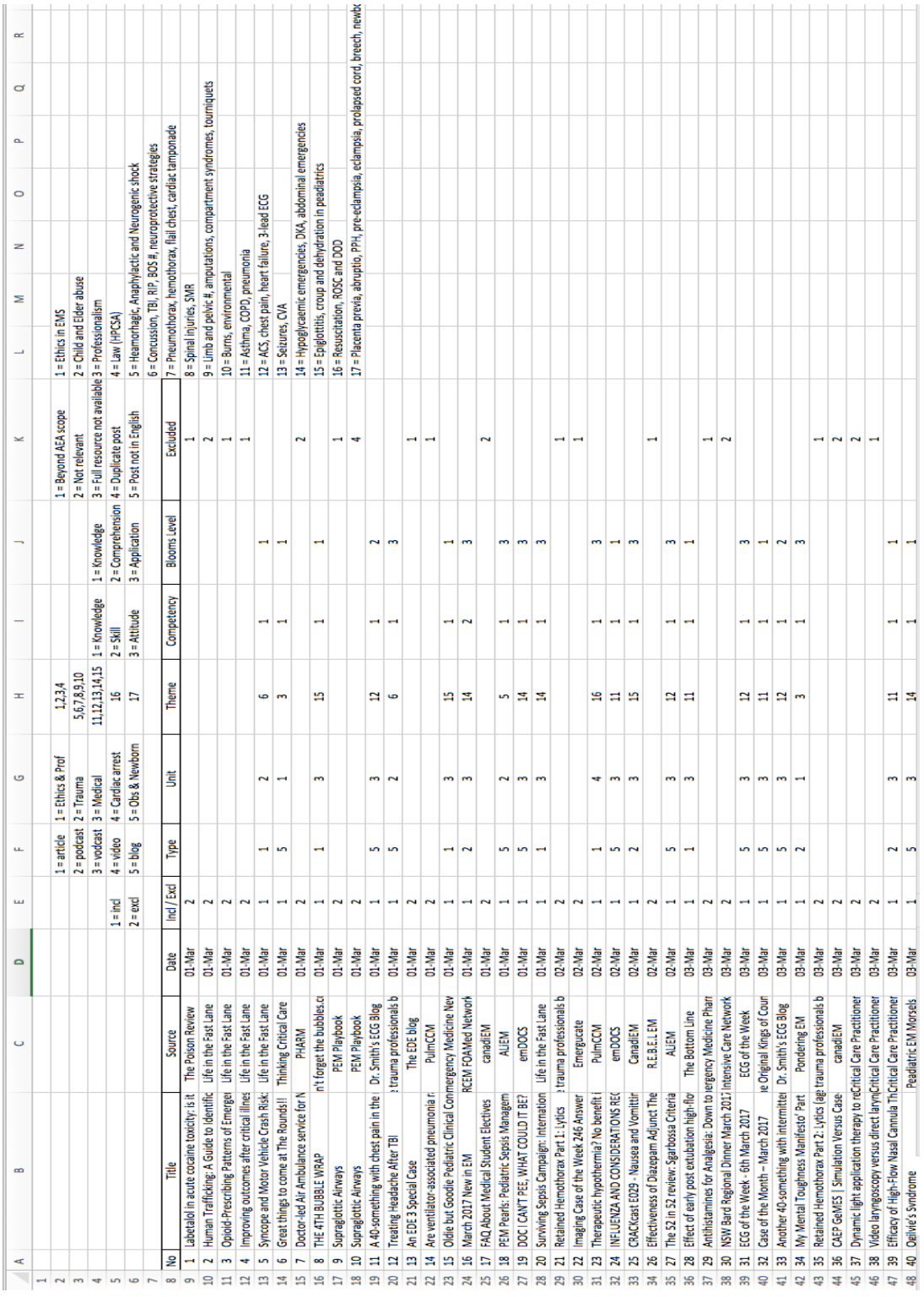
General					
CPR (adult, child, infant & neonate)	√	√	√	√	√
Patient clinical assessment	√	√	√	√	√
Vital sign assessment	√	√	√	√	√
Finger prick and blood glucose measurement	√	√	√	√	√
Cervical spinal clearance			√	√	√
Application of cervical collar	√	√	√	√	√
Application of head blocks	√	√	√	√	√
Application of spider harness	√	√	√	√	√
Spinal immobilization using scoop stretcher & long spinal board	√	√	√	√	√
Spinal immobilization using an extrication device	√	√	√	√	√
Application of splints including the traction splint	√	√	√	√	√
Application of vacuum mattress		√	√	√	√
Use of stretchers	√	√	√	√	√
Urinary catheterization			√	√	√
Basic wound care and application of dressings	√	√	√	√	√
Suturing		√	√		√
Declaration of death:withdrawal of resuscitation efforts		√	√	√	√
Declaration of death: withholding resuscitation	√	√	√	√	√
Administration of medication as per current HPCSA protocol	√	√	√	√	√

General patient inter-facility transfer	√	√	√	√	√
Intensive care transfer			√		√
Neonatal transfer (non-intubated patient)		√	√	√	√
Neonatal intensive care transfer			√		√

Addendum B: AEA-refresher course outcomes

Ethics & Professionalism		
1.	Ethics in the EMS (types of consent)	Relevance to context of South Africa and the Health Professions Council of South Africa (HPCSA)
2.	Child and elder abuse	
3.	Professionalism (characteristics of a professional, bedside manner, patient rights, patient care documentation and handling emergency vehicles)	
4.	Law (patient rights and the role of regulatory bodies in the health professions)	
Trauma Emergencies		
5.	Haemorrhagic-, anaphylactic- and neurogenic shock	Pathophysiology Causes Clinical presentation Treatment
6.	Concussion, closed head injuries (raised intra-cranial pressure), base of skull fracture and specific neuroprotective strategies	
7.	Open pneumothorax, tension- and pneumothorax, hemothorax, flail chest and cardiac tamponade	
8.	Spinal Injuries, spinal motion restriction	
9.	Limb and pelvic fractures, amputations and compartment syndrome (rhabdomyolysis), the use of tourniquets	
10.	Burns (types and severity)	
Medical Emergencies		
11.	Asthma, chronic obstructive pulmonary disease (COPD) and pneumonia	Pathophysiology Causes Clinical presentation Treatment
12.	Acute coronary syndromes (myocardial infarction and angina), chest pain, heart failure and 3-lead ECG review	
13.	Seizures and cerebrovascular attack (CVA)	
14.	Hypoglycaemic emergency and diabetic keto-acidosis, other medical emergencies	
15.	Epiglottitis, croup and dehydration in pediatrics, other pediatrics	
Cardiac Arrest Management		
16.	Resuscitation (shockable and non-shockable arrest management), post-cardiac arrest management and declaration of death	Pathophysiology Causes Clinical presentation Treatment
Obstetrics and New-born Care		
17.	Placenta previa, placenta abruptio, post-partum haemorrhage, pre-eclampsia, eclampsia, prolapsed cord presentation, breech presentation, new-born care	Pathophysiology Causes Clinical presentation Treatment

Addendum C: Recorded data (Microsoft Excel®)



No	Title	Source	Date	Incl / Excl	Type	Unit	Theme	Competency	Blooms Level	Excluded
1	Labetalol in acute cocaine toxicity: is it	The Poison Review	01-Mar	2						1
2	Human Trafficking: A Guide to Identific	Life in the Fast Lane	01-Mar	2						2
3	Opioid-Prescribing Patterns of Emergen	Life in the Fast Lane	01-Mar	2						1
4	Improving outcomes after critical illnes	Life in the Fast Lane	01-Mar	2						1
5	Syncope and Motor Vehicle Crash Risk:	Life in the Fast Lane	01-Mar	1	1	2	6	1	1	
6	Great things to come at The Rounds!!	Thinking Critical Care	01-Mar	1	5	1	3	1	1	
7	Doctor-led Air Ambulance service for N	PHARM	01-Mar	2						2
8	THE 4TH BUBBLE WRAP	n't forget the bubbles.cr	01-Mar	1	1	3	15	1	1	
9	Supraglottic Airways	PEM Playbook	01-Mar	2						1
10	Supraglottic Airways	PEM Playbook	01-Mar	2						4
11	A 40-something with chest pain in the	Dr. Smith's ECG Blog	01-Mar	1	5	3	12	1	2	
12	Treating Headache After TBI	s trauma professionals b	01-Mar	1	5	2	6	1	3	
13	An EDE 3 Special Case	The EDE blog	01-Mar	2						1
14	Are ventilator-associated pneumonia r	PulmCCM	01-Mar	2						1
15	Oldie but Goodie Pediatric Clinical Commergency Medicine Nev		01-Mar	1	1	3	15	1	1	
16	March 2017 New in EM	RCEM FOAMed Network	01-Mar	1	2	3	14	2	3	
17	FAQ About Medical Student Electives	canadiEM	01-Mar	2						2
18	PEM Pearls: Pediatric Sepsis Managem	AUEM	01-Mar	1	5	2	5	1	3	
19	DOC I CANT PEE, WHAT COULD IT BE?	emDOCS	01-Mar	1	5	3	14	1	3	
20	Surviving Sepsis Campaign: Internation	Life in the Fast Lane	01-Mar	1	1	3	14	1	3	
21	Retained Hemothorax Part 1: Lytics	s trauma professionals b	02-Mar	2						1
22	Imaging Case of the Week 246 Answer	Emergucate	02-Mar	2						1
23	Therapeutic hypothermia? No benefit i	PulmCCM	02-Mar	1	1	4	16	1	3	
24	INFLUENZA AND CONSIDERATIONS REC	emDOCS	02-Mar	1	5	3	11	1	1	
25	CRACKcast E029 - Nausea and Vomitin	CanadiEM	02-Mar	1	2	3	15	1	3	
26	Effectiveness of Diazepam Adjunct The	R.E.B.E.L EM	02-Mar	2						1
27	The 52 in 52 review - Sgarbossa Criteria	AUEM	02-Mar	1	5	3	12	1	3	
28	Effect of early post extubation high-flo	The Bottom Line	03-Mar	1	1	3	11	1	1	
29	Antihistamines for Analgesia: Down to ergency Medicine Pharr		03-Mar	2						1
30	NSW Baird Regional Dinner March 2017 Intensive Care Network		03-Mar	2						2
31	ECG of the Week - 6th March 2017	ECG of the Week	03-Mar	1	5	3	12	1	3	
32	Case of the Month – March 2017	ie Original Kings of Coun	03-Mar	1	5	3	11	1	1	
33	Another 40-something with intermitter	Dr. Smith's ECG Blog	03-Mar	1	5	3	12	1	2	
34	My Mental Toughness Manifesto' Part	Pondering EM	03-Mar	1	2	1	3	1	3	
35	Retained Hemothorax Part 2: Lytics (age trauma professionals b		03-Mar	2						1
36	C&EP GeMES Simulation Versus Case	canadiEM	03-Mar	2						2
37	Dynamic light application therapy to reCritical Care Practitioner		03-Mar	2						2
38	Video laryngoscopy versus direct laryngCritical Care Practitioner		03-Mar	2						1
39	Efficacy of High-Flow Nasal Cannula ThCritical Care Practitioner		03-Mar	1	2	3	11	1	1	
40	Qelivile's Syndrome	Peadiatric EM Morsels	03-Mar	1	5	3	14	1	1	

1 = Beyond AEA scope	1 = Ethics in EMS
2 = Not relevant	2 = Child and Elder abuse
3 = Full resource not available	3 = Professionalism
4 = Duplicate post	4 = Law (HPCSA)
5 = Post not in English	5 = Heamorhagic, Anaphylactic and Neurogenic shock
	6 = Concussion, TBI, RIP, BOS #, neuroprotective strategies
	7 = Pneumothorax, hemothorax, flail chest, cardiac tamponade
	8 = Spinal injuries, SMR
	9 = Limb and pelvic #, amputations, compartment syndromes, tourniquets
	10 = Burns, environmental
	11 = Asthma, COPD, pneumonia
	12 = ACS, chest pain, heart failure, 3-lead ECG
	13 = Seizures, CVA
	14 = Hypoglycaemic emergencies, DKA, abdominal emergencies
	15 = Epiglottitis, croup and dehydration in peadiatrics
	16 = Resuscitation, ROSC and DOD
	17 = Placenta previa, abruptio, PPH, pre-eclampsia, eclampsia, prolapsed cord, breech, newbo

1 = article	1 = Ethics & Prof
2 = podcast	2 = Trauma
3 = vodcast	3 = Medical
1 = incl	4 = Cardiac arrest
2 = excl	5 = Obs & Newborn

1,2,3,4	
5,6,7,8,9,10	
11,12,13,14,15	
16	
17	

1 = Knowledge	
2 = Skill	
3 = Attitude	

1 = Knowledge	
2 = Comprehension	
3 = Application	

Addendum D: AIR score instrument

Score	BEEM Rater Scale	Content Accuracy	Educational Utility	Evidence-Based Medicine	Referencing
Assuming that the results of this article are valid, how much does it affect emergency medicine clinical practice?	Do you have any concerns about the accuracy of the data presented or conclusions of this article?	Are there useful educational pearls in this article for residents?	Does this article reflect EBM and thus lack bias?	Are the authors and literature clearly cited?	
1	Useless information	Yes, many concerns from many inaccuracies	Low value: no valuable pearls	Not EBM based; only expert opinion	No
2	Not really interesting, not really new, changes nothing	—	—	—	—
3	Interesting and new but does not change practice	Yes, a major concern about few inaccuracies	Yes, but there are only a few (1–2) valuable or multiple (≥3) less-valuable educational pearls	Minimally EBM based	—
4	Interesting and new; has the potential to change practice	—	—	—	Yes, authors and general references are listed (but no online references)
5	New and important: this would probably change practice for some emergency physicians	Minimal concerns over minor inaccuracies	Yes, there are several (≥3) valuable educational pearls, or a few (1–2) key educational pearls that every resident should know before graduating	Mostly EBM based	—
6	New and important: this would change practice for most emergency physicians	—	—	—	—
7	This is a "must know" for emergency physicians	No concerns over inaccuracies	Yes, there are multiple key educational pearls that residents should know before graduating	Yes, exclusively EBM based (unbiased)	Yes, authors and online references are provided

BEEM, Best Evidence in Emergency Medicine; *EBM*, evidence-based medicine.

Addendum E: African Journal of Health Professions Education author publication guidelines

Author Guidelines

Author Guidelines

Please view the Author Tutorial for guidance on how to submit on Editorial Manager.

To submit a manuscript, please proceed to the AJHPE Editorial Manager website: www.editorialmanager.com/ajhpe

To access and submit an article already in production, please see the guidelines here.

Author Guidelines

Please take the time to familiarise yourself with the policies and processes below. If you still have any questions, please do not hesitate to ask our editorial staff (tel.: +27 (0)21 532 1281, email: submissions@hmpg.co.za).

Authorship

Named authors must consent to publication. Authorship should be based on: (*i*) substantial contribution to conceptualisation, design, analysis and interpretation of data; (*ii*) drafting or critical revision of important scientific content; or (*iii*) approval of the version to be published. These conditions must all be met for an individual to be included as an author (uniform requirements for manuscripts submitted to biomedical journals; refer to www.icmje.org)

If authors' names are added or deleted after submission of an article, or the order of the names is changed, all authors must agree to this in writing.

Please note that co-authors will be requested to verify their contribution upon submission. Non-verification may lead to delays in the processing of submissions.

Author contributions should be listed/described in the manuscript.

Conflicts of interest

Conflicts of interest can derive from any kind of relationship or association that may influence authors' or reviewers' opinions about the subject matter of a paper. The existence of a conflict – whether actual, perceived or potential – does not preclude publication of an article. However, we aim to ensure that, in such cases, readers have all the information they need to enable them to make an informed assessment about a publication's message and conclusions. We require that both authors and reviewers declare all sources of support for their research, any personal or financial relationships (including honoraria, speaking fees, gifts received, etc) with relevant individuals or organisations connected to the topic of

the paper, and any association with a product or subject that may constitute a real, perceived or potential conflict of interest. If you are unsure whether a specific relationship constitutes a conflict, please contact the editorial team for advice. If a conflict remains undisclosed and is later brought to the attention of the editorial team, it will be considered a serious issue prompting an investigation with the possibility of retraction.

Research ethics committee approval

Authors must provide evidence of Research Ethics Committee approval of the research where relevant. Ensure the correct, full ethics committee name and reference number is included in the manuscript.

If the study was carried out using data from provincial healthcare facilities, or required active data collection through facility visits or staff interviews, approval should be sought from the relevant provincial authorities. For South African authors, please refer to the guidelines for submission to the National Health Research Database. Research involving human subjects must be conducted according to the principles outlined in the Declaration of Helsinki. Please refer to the National Department of Health's guideline on Ethics in Health research: principles, processes and structures to ensure that the appropriate requirements for conducting research have been met, and that the HPCSA's General Ethical Guidelines for Health Researchers have been adhered to.

Protection of rights to privacy

Research Participants

Information that would enable identification of individual research participants should not be published in written descriptions, photographs, radiographs and pedigrees unless the information is essential for scientific purposes and the patient (or parent or guardian) has given informed written consent for publication and distribution. We further recommend that the published article is disseminated not only to the involved researchers but also to the patients/participants from whom the data was drawn. Refer to Protection of Research Participants. The signed consent form should be submitted with the manuscript to enable verification by the editorial team.

Other individuals

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permission to reproduce the image has been granted to the author/s. This letter should be uploaded as a supplementary file during submission.

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Ethnic/race classification

Use of racial or ethnicity classifications in research is fraught with problems. If you choose to use a research design that involves classification of participants based on race or ethnicity, or discuss issues with reference to such classifications, please ensure that you include a detailed rationale for doing so, ensure that the categories you describe are carefully defined, and that socioeconomic, cultural and lifestyle variables that may underlie perceived racial disparities are appropriately controlled for. Please also clearly specify whether race or ethnicity is classified as reported by the patient (self-identifying) or as perceived by the investigators. Please note thatit is not appropriate to use self-reported or investigator-assigned racial or ethnic categories for genetic studies.

Continuing Professional Development (CPD)

AJHPE is an HPCSA-accredited service provider of CPD materials. Principal authors can earn up to 15 CPD continuing education units (CEUs) for publishing an article; co-authors are eligible to earn up to 5 CEUs; and reviewers of articles can earn 3 CEUs. Each month, *AJHPE* also publishes a CPD-accredited questionnaire relating to the academic content of the journal. Successful completion of the questionnaire with a pass rate of 70% will earn the reader 3 CEUs. Administration of our CPD programme is managed by Medical Practice Consulting. To complete questionnaires and obtain certificates, please visit MRP Consulting

Manuscript preparation

Preparing an article for anonymous review

To ensure a fair and unbiased review process, all submissions are to include an anonymised version of the manuscript. The exceptions to this requirement are Correspondence, Book reviews and Obituary submissions.

Submitting a manuscript that needs additional blinding can slow down your review process, so please be sure to follow these simple guidelines as much as possible:

- An anonymous version should not contain any author, affiliation or particular institutional details that will enable identification.
- Please remove title page, acknowledgements, contact details, funding grants to a named person, and any running headers of author names.
- Mask self-citations by referring to your own work in third person.

General article format/layout

Submitted manuscripts that are not in the correct format specified in these guidelines will be returned to the author(s) for correction prior to being sent for review, which will delay publication.

General:

- Manuscripts must be written in UK English (this includes spelling).
- The manuscript must be in Microsoft Word or RTF document format. Text must be 1.5 line spaced, in 12-point Times New Roman font, and contain no unnecessary formatting (such as text in boxes). Pages and lines should be numbered consecutively.
- Please make your article concise, even if it is below the word limit.
- Qualifications, ***full*** affiliation (department, school/faculty, institution, city, country) and contact details of ALL authors must be provided in the manuscript and in the online submission process.
- Abbreviations should be spelt out when first used and thereafter used consistently, e.g. 'intravenous (IV)' or 'Department of Health (DoH)'.
- Numbers should be written as grouped per thousand-units, i.e. 4 000, 22 160.
- Quotes should be placed in single quotation marks: i.e. The respondent stated: '...'
- Round brackets (parentheses) should be used, as opposed to square brackets, which are reserved for denoting concentrations or insertions in direct quotes.

If you wish material to be in a box, simply indicate this in the text. You may use the table format –this is the *only* exception. Please DO NOT use fill, format lines and so on.

Preparation notes by article type

Research

Guideline word limit: 3 000 words (excluding abstract and bibliography)

Research articles describe the background, methods, results and conclusions of an original research study. The article should contain the following sections: introduction, methods, results, discussion and conclusion, and should include a structured abstract (see below). The introduction should be concise – no more than three paragraphs – on the background to the research question, and must include references to other relevant published studies that clearly lay out the rationale for conducting the study. Some common reasons for conducting a study are: to fill a gap in the literature, a logical extension of previous work, or to answer an important question. If other papers related to the same study have been published previously, please make sure to refer to them specifically. Describe the study methods in as much detail as possible so that others would be able to replicate the study should they need to. Where appropriate, sample size calculations should be included to demonstrate that the study is not underpowered. Results should describe the study sample as well as the findings from the study itself, but all interpretation of findings must be kept in the discussion section. The conclusion should briefly summarise the main message of the paper and provide recommendations for further study.

- May include up to 6 illustrations or tables.
- A max of 20 - 25 references

Structured abstract

- This should be no more than 250 words, with the following recommended headings:
  - **Background:** why the study is being done and how it relates to other published work.
  - **Objectives:** what the study intends to find out

- **Methods:** must include study design, number of participants, description of the research tools/instruments, any specific analyses that were done on the data.
- **Results:** first sentence must be brief population and sample description; outline the results according to the methods described. Primary outcomes must be described first, even if they are not the most significant findings of the study.
- **Conclusion:** must be supported by the data, include recommendations for further study/actions.
- Please ensure that the structured abstract is complete, accurate and clear and has been approved by all authors. It should be able to be intelligible to the reader without referral to the main body of the article.
- Do not include any references in the abstracts.

Here is an example of a good abstract.

Illustrations/photos/scans

- If illustrations submitted have been published elsewhere, the author(s) should provide evidence of consent to republication obtained from the copyright holder.
- Figures must be numbered in Arabic numerals and referred to in the text e.g. '(Fig. 1)'.
- Each figure must have a caption/legend: Fig. 1. Description (any abbreviations in full).
- All images must be of high enough resolution/quality for print.
- All illustrations (graphs, diagrams, charts, etc.) must be in PDF form.
- Ensure all graph axes are labelled appropriately, with a heading/description and units (as necessary) indicated. Do not include decimal places if not necessary e.g. 0; 1.0; 2.0; 3.0; 4.0 etc.
- Each image must be attached individually as a 'supplementary file' upon submission (not solely embedded in the accompanying manuscript) and named Fig. 1, Fig. 2, etc.

Tables

- Tables should be constructed carefully and simply for intelligible data representation. Unnecessarily complicated tables are strongly discouraged.
- Large tables will generally not be accepted for publication in their entirety. Please consider shortening and using the text to highlight specific important sections, or offer a large table as an addendum to the publication, but available in full on request from the author.
- Embed/include each table in the manuscript Word file - do not provide separately as supplementary files.
- Number each table in Arabic numerals (Table 1, Table 2, etc.) consecutively as they are referred to in the text.
- Tables must be cell-based (i.e. not constructed with text boxes or tabs) and editable.
- Ensure each table has a concise title and column headings, and include units where necessary.
- Footnotes must be indicated with consecutive use of the following symbols: * † ‡ § ¶ || then ** †† ‡‡ etc.

Do not: Use [Enter] within a row to make ‘new rows’:

Rather:

Each row of data must have its own proper row:

Do not: use separate columns for *n* and %:

Rather:

Combine into one column, *n* (%):

Do not: have overlapping categories, e.g.:

Rather:

Use <> symbols or numbers that don't overlap:

References

NB: *Only complete, correctly formatted reference lists in Vancouver style will be accepted. If reference manager software is used, the reference list and citations in text are to be unformatted to plain text before submitting..*

- Authors must verify references from original sources.
- Citations should be inserted in the text as superscript numbers between square brackets, e.g. These regulations are endorsed by the World Health Organization,[2] and others.[3,4-6]
- All references should be listed at the end of the article in numerical order of appearance in the Vancouver style (not alphabetical order).
- Approved abbreviations of journal titles must be used; see the List of Journals in Index Medicus.
- Names and initials of all authors should be given; if there are more than six authors, the first three names should be given followed by et al.
- Volume and issue numbers should be given.
- First and last page, in full, should be given e.g.: 1215-1217 **not** 1215-17.
- Wherever possible, references must be accompanied by a digital object identifier (DOI) link). Authors are encouraged to use the DOI lookup service offered by CrossRef:
    - On the Crossref homepage, paste the article title into the 'Metadata search' box.
    - Look for the correct, matching article in the list of results.
    - Click Actions > Cite
    - Alongside 'url =' copy the URL between { }.
    - Provide as follows, e.g.: https://doi.org/10.7196/07294.937.98x

Some examples:

- *Journal references:* Price NC, Jacobs NN, Roberts DA, et al. Importance of asking about glaucoma. Stat Med 1998;289(1):350-355. http://dx.doi.org/10.1000/hgjr.182
- *Book references:* Jeffcoate N. Principles of Gynaecology. 4th ed. London: Butterworth, 1975:96-101.
- *Chapter/section in a book:* Weinstein L, Swartz MN. Pathogenic Properties of Invading Microorganisms. In: Sodeman WA, Sodeman WA, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974:457-472.
- *Internet references:* World Health Organization. The World Health Report 2002 - Reducing Risks, Promoting Healthy Life. Geneva: WHO, 2002. http://www.who.int/whr/2002 (accessed 16 January 2010).
- Legal references
- Government Gazettes:

National Department of Health, South Africa. National Policy for Health Act, 1990 (Act No. 116 of 1990). Free primary health care services. Government Gazette No. 17507:1514. 1996.

In this example, 17507 is the Gazette Number. This is followed by :1514 - this is the notice number in this Gazette.

- Provincial Gazettes:

Gauteng Province, South Africa; Department of Agriculture, Conservation, Environment and Land Affairs. Publication of the Gauteng health care waste management draft regulations. Gauteng Provincial Gazette No. 373:3003, 2003.

- Acts:

South Africa. National Health Act No. 61 of 2003.

- Regulations to an Act:

South Africa. National Health Act of 2003. Regulations: Rendering of clinical forensic medicine services. Government Gazette No. 35099, 2012. (Published under Government Notice R176).

- Bills:

South Africa. Traditional Health Practitioners Bill, No. B66B-2003, 2006.

- Green/white papers:

South Africa. Department of Health Green Paper: National Health Insurance in South Africa. 2011.

- Case law:

Rex v Jopp and Another 1949 (4) SA 11 (N)

Rex v Jopp and Another: Name of the parties concerned

1949: Date of decision (or when the case was heard)

(4): Volume number

SA: SA Law Reports

11: Page or section number

(N): In this case Natal - where the case was heard. Similarly, (C) woud indicate Cape, (G) Gauteng, and so on.

NOTE: no . after the v

- *Other references (e.g. reports) should follow the same format:* Author(s). Title. Publisher place: Publisher name, year; pages.
- Cited manuscripts that have been accepted but not yet published can be included as references followed by '(in press)'.
- Unpublished observations and personal communications in the text must **not** appear in the reference list. The full name of the source person must be provided for personal communications e.g. '...(Prof. Michael Jones, personal communication)'.

From submission to acceptance

Submission and peer-review

To submit an article:

- Please ensure that you have prepared your manuscript in line with the AJHPE requirements.
- All submissions should be submitted via Editorial Manager
- The following are required for your submission to be complete:
    - Anonymous manuscript (unless otherwise stated)
    - Author Agreement form
    - Manuscript
    - Any supplementary files: figures, datasets, patient consent form, permissions for published images, etc.
    - Once the submission has been successfully processed on Editorial Manager, it will undergo a technical check by the Editorial Office before it will be assigned to an editor who will handle the review process. If the author guidelines have not been appropriately followed, the manuscript may be sent back to the author for correcting.

Peer Review Process

All manuscripts are reviewed initially by the Editor-in-Chief and only those that meet the scientific and editorial standards of the journal, and fit within the aims and scope of the journal, will be sent for external peer review. Each manuscript is reviewed by two reviewers selected on the basis of their expertise in the field. A double blind review process is followed at AJHPE.

Authors are expected to receive feedback from reviewers and an editorial decision within approximately 6 weeks of submission. The time period of the entire review process may vary however depending upon the quality of the manuscript submitted, reviewers' responses and the time taken by the authors to submit the revised manuscript.

Manuscripts from review may be accepted, rejected or returned to the author for revision or resubmission for review. Authors will be directed to submit revised manuscripts within two months of receiving the editor's decision, and are requested to submit a point by point response to the reviewers' comments. Manuscripts which authors are requested to revise and resubmit will be sent for a second round of peer review, often to the original set of reviewers. All final decisions on a manuscript are at the Editor's discretion.

Article Processing Charges

There is currently no article-processing charge (APC), also known as page fees, for the publication of manuscripts.

Please refer to the section on 'Sponsored Supplements' regarding the publication of supplements, where a charge is currently applicable. Queries can be directed to Claudian@hmpg.co.za

Production process

The following process should usually take between 4 - 6 weeks:

1. An accepted manuscript is passed to a Managing Editor to assign to a copyeditor (CE).
2. The CE copyedits in Word, working on house style, format, spelling/grammar/punctuation, sense and consistency, and preparation for typesetting.
3. If the CE has an author queries, he/she will contact the corresponding author and send them the copyedited Word doc, asking them to solve the queries by means of track changes or comment boxes.
4. The authors are typically asked to respond within 1-3 days. Any comments/changes must be clearly indicated e.g. by means of track changes. Do not work in the original manuscript - work in the copyedited file sent to you and make your changes clear.
5. The CE will finalise the article and then it will be typeset.
6. Once typeset, the CE will send a PDF of the file to the authors to complete their final check, while simultaneously sending to the 2nd-eye proofreader.
7. The authors are typically asked to complete their final check and sign-off within 1-2 days. No major additional changes can be accommodated at this point.
8. The CE implements the authors' and proofreader's mark-ups, finalises the file, and prepares it for the upcoming issue.

Changing contact details or authorship

Please notify the Editorial Department of any contact detail changes, including email, to facilitate communication.

Errata and retractions

Errata

Should you become aware of an error or inaccuracy in yours or someone else's contribution after it has been published, please inform us as soon as possible via an email to publishing@hmpg.co.za,including the following details:

- Journal, volume and issue in which published
- Article title and authors
- Description of error and details of where it appears in the published article
- Full detail of proposed correction and rationale

We will investigate the issue and provide feedback. If appropriate, we will correct the web version immediately, and will publish an erratum in the next issue. All investigations will be conducted in accordance with guidelines provided by the Committee on Publication Ethics (COPE).

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Addendum F: Author information

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